

PCT

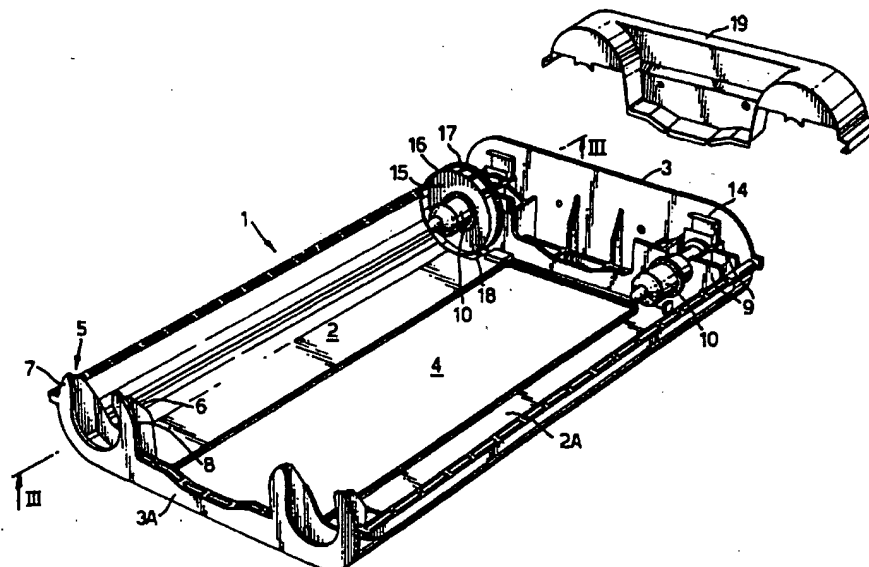
WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B41J 17/36, 17/32		A1	(11) International Publication Number: WO 98/04415
			(43) International Publication Date: 5 February 1998 (05.02.98)
(21) International Application Number: PCT/GB97/01961		(81) Designated States: JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 21 July 1997 (21.07.97)		Published With international search report.	
(30) Priority Data: 9616032.0 31 July 1996 (31.07.96) GB			
(71) Applicant (for all designated States except US): IMPERIAL CHEMICAL INDUSTRIES PLC [GB/GB]; Imperial Chemical House, Millbank, London SW1P 3JF (GB).			
(72) Inventors; and			
(75) Inventors/Applicants (for US only): NELSON, Anthony, John [GB/GB]; 2 Yew Tree Rise, Wickham Market, Woodbridge, Suffolk IP13 0UA (GB). BURCH, Terence, John [GB/GB]; 3 Glenhurst Avenue, Ipswich IP4 4RA (GB). ORTON, Jeffrey, Bruce [GB/GB]; 16 Owls Retreat, Colchester, Essex CO4 3FE (GB). HANN, Richard, Anthony [GB/GB]; 22 Woodstone Avenue, Ipswich, Suffolk IP1 3TE (GB).			
(74) Agents: MILLROSS, Christopher, Robert et al.; ICI Group Intellectual Property, P.O. Box 90, Wilton, Middlesbrough, Cleveland TS90 8JE (GB).			

(54) Title: CASSETTE CASING FOR THERMAL TRANSFER PRINTING DYE RIBBON



(57) Abstract

A cassette for a thermal transfer dye ribbon comprises a casing (1) containing bearing means (10) having rotably mounted thereon a cylindrical member (15) having on its periphery a mark (16) carrying information capable of being detected by a sensor on rotation of the member (15) and means operatively engageable with a drive source which is disposed outside the casing to cause rotation of the member.

BEST AVAILABLE COPY

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LJ	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

Cassette Casing for Thermal Transfer Printing Dye Ribbon

This invention relates to thermal transfer printing and more particularly to a cassette casing for holding the thermal transfer ribbon during storage and when in use in a thermal printer.

5 Thermal transfer printing is a generic term for processes in which one or more thermally transferable dyes are caused to transfer from a dye sheet to a receiver sheet in response to thermal stimuli. Using a dye sheet comprising a thin substrate supporting a dye coat containing one or more such dyes uniformly spread over an entire printing area of the dye sheet, printing can be effected by heating selected discrete areas of the dye sheet whilst
10 the dye coat is pressed against a receiver sheet. The shape of the pattern transferred is determined by the number and location of the discrete areas which are subject to heating. Complex images can be built up from large numbers of very small pixels placed close together, the resolution of the final image being determined by the number, size and spacing of such pixels. Full colour prints can be produced by printing with different coloured dye
15 coats sequentially in like manner. Usually, the dye sheet is in the form of a ribbon with the different coloured dye coats being in the form of discrete stripes transverse to the axis of the ribbon in a repeated sequence along the ribbon, printing of the three colours being effected by moving the dye ribbon, in a printer, axially relative to the receiver sheet and whatever means are used to generate the thermal stimuli such as a print head consisting of a plurality
20 of tiny heaters or a laser beam.

Conventionally, the ribbon is rolled up and stored in a cassette which consists essentially of a pair of spools and a moulded casing in which the spools are rotatably mounted in parallel and spaced apart positions. Each spool has end portions, by means of which the spool is mounted in the casing and a bobbin portion on which the ink ribbon is
25 wound, one of the spools acting as a feed spool and the other acting as a take-up spool.

Cassette casings typically comprise two parallel, hemi-cylindrical spool housings having end portions interconnected by bridge members such that the housing and bridge members together define an open access port through which the ink ribbon is exposed to the thermal stimuli as it extends from one spool to the other.

30 Such a cassette has the drawback that no information is provided to the printer about the type and/or characteristics of the ink ribbon contained therein, for example whether the ribbon is mono or polychromatic or about the heat sensitivity of the specific dyes in the ribbon.

It is known to provide an information mark on the outside of the cassette which can
35 be read by a sensor in the printer on insertion of the cassette. However, the amount of

information that can be made available is limited in dependence on the amount of movement of the cassette past the sensor unless the sensor itself is capable of movement, which arrangement would unnecessarily complicate the printer.

US Patent No 5385414 discloses a way of solving this problem by providing the information mark on the peripheral surface of the feed spool. On insertion of the cassette into the printer, the feed spool is rotated so that the information mark passes by a sensor. The amount of information that can be made available is thus independent of the way in which the cassette is inserted.

As pointed out in US Patent No 5290114, this arrangement has the disadvantage that a portion of the ribbon is of necessity unwound during the information reading operation and either this portion is wasted or must be rewound before printing can start.

According to US 5290114, this disadvantage may be overcome by providing the feed spool with a coaxial shaft portion and mounting a ring bearing the information mark on said shaft portion so that it can be rotated independently of the feed spool itself by drive means located in the printer.

The cassette body may be designed so that it can be reloaded with dye ribbon by the end-user, thus saving on the usage of raw materials and providing both cost and environmental benefits.

However, the arrangement of US 5290114 results in a complex spool manufacturing process and, if the cassette is of the reloadable type, excessive wastage of raw materials required for a code wheel on each feed spool.

According to the present invention there is provided a dye ribbon cassette for thermal transfer printing comprising a casing containing bearing means having rotatably mounted thereon a cylindrical member having on its periphery a mark carrying information capable of being detected by a sensor on rotation of the member and means operatively engageable with a drive source which is disposed outside of said casing to cause rotation of the member.

The arrangement according to the invention has several advantages over the arrangement of US 5290114. In US 5290114, each assembly of dye ribbon and feed and take-up spools requires its own cylindrical information carrying member whereas in the arrangement of the invention only one per casing is needed giving a reduction in materials usage and costs. There is also the risk of the information carrying member of US 5290114 being damaged by clumsy handling during loading of a dye ribbon into the casing which risk is obviated in the arrangement of the invention. Also, in the arrangement of the invention, the assembly of the dye ribbon on to the feed and take-up spools is simplified and there is less chance of errors occurring.

Clearly, the positional relationship of the information carrying member to the drive means and the sensor, which are located in the printer, is critical for correct operation. In the invention, the information carrying member is fixed in position during manufacture of the casing whereas in US 5290114 reliance is placed the feed spool being correctly positioned 5 during reloading by the user. As a consequence, to reduce the possibility of incorrect positioning, the feed spool must be manufactured to exact dimensions whereas wider tolerances are possible with the arrangement of the invention

The arrangement of the invention allows the feed and take-up spools to be identical which means that the spent feed spool can be used as a take-up spool. This is not 10 possible with the arrangement of US 5385414 and in the case of US 5290114 either feed and take-up spools must be supplied or the additional step of removing the information carrying member from the spent feed spool is necessary making it difficult for the end user to reload the cassette body with fresh dyesheet.

The information carrying member may be mounted so as to be co-axial with the 15 feed spool. Alternatively, it may be offset which has the advantage that different positioning of the sensor and the drive means can be accommodated

According to a preferred aspect of the invention, a pair of identical, spaced apart shafts are rigidly mounted at one end of the casing, the cylindrical member being mounted on one of said shafts so as to be rotatable thereon, the shaft protruding therethrough and 20 forming a mounting point for a feed spool.

Each shaft preferably has an axial bore therein through which passes a rod, a spring being positioned between the rod and an endwall of the casing so that the rod is capable of axial movement against the tension of the spring.

According to a further aspect of the invention, there is provided a cassette for 25 thermal transfer printing comprising a casing comprising two parallel, hemi-cylindrical spool housings having end portions interconnected by bridge members, the housings and bridge members together defining an open access port, a feed spool and a take-up spool located in said housings with a dye ribbon extending therebetween so as to extend across the port, a pair of identical shafts rigidly mounted on one of the bridge members so as to extend along 30 the axes of the spool housings, each shaft having an axial bore therein through which passes a spring-loaded, axially movable rod, the end of which locates in and forms a mounting for a spool, a cylindrical member rotatably mounted on the shaft located in the feed spool and having on its peripheral surface a mark carrying information capable of being detected by a sensor on rotation of the member and means operatively engageable with a 35 drive source which is disposed outside the casing to cause rotation of the member.

The invention will be more readily understood from the following description of an embodiment taken in conjunction with the accompanying drawing in which

Figure 1 shows an embodiment of a cassette casing;

Figure 2 shows a dye ribbon feed unit for use in the casing of Figure 1; and

5 Figure 3 is a cross-sectional view of a feed spool in the casing as indicated by lines III-III in Figures 1 and 2.

Referring to Figure 1, a casing 1, moulded from a suitable plastics material such as acrylonitrile/butadiene/styrene copolymer, which has the advantage of being re-cyclable, comprises two parallel, hemi-cylindrical spool housings 2, 2A having end portions 10 interconnected by bridge members 3, 3A such that the housings and the bridge members together define an open access port 4. The bridge member 3A is formed so as to provide first spool locating means 5 consisting of a rib 6 and two arcuate upstands 7, 8 to form a major portion of an incomplete retaining ring. The bridge member 3 is provided with a pair of webs 9, each containing a U-shaped aperture in which a shaft 10 is rigidly mounted so as 15 to be in line with the axis of the cylindrical portions and forming second spool locating means.

As shown in more detail in Figure 3, each shaft 10 has an axial bore 11 therein through which passes a rod 12 having an enlarged head 13 and a leaf spring 14 is positioned between the head 13 and an endwall of the casing 1 so that the rod is capable of axial 20 movement against the tension of the spring 14.

The shaft mounted in the hemi-cylindrical portion 2 of the casing has a cylindrical member 15 rotatably mounted thereon, the peripheral surface of the cylindrical member carrying an information mark 16, e.g. a bar code, and a gear ring 17. As can be seen from Figure 1, the shaft 10 is sufficiently long so as to protrude past the end face of the cylindrical 25 member. An aperture 18 in the casing allows engagement of the gear ring 17 by suitable drive means in the printer, for example drive means as described in US Patent No. 5385416. The ends of the shafts and the leaf springs are enclosed and retained in the webs by a cover 19. As shown in Figure 3, axial movement of the cylindrical member on the shaft is prevented by the cylindrical member being located between an annular protrusion 20 on the 30 shaft and the cover.

Referring now to Figure 2, a dye ribbon unit for insertion into the casing, consists of a take-up spool 21 to which the end of a dye ribbon 22 is attached and a feed spool 23 on which the dye ribbon is wound. The spools are identical and each consists of a cylindrical, bobbin portion 24 carrying a first flange 25 at one end and a second flange 26 spaced from 35 the first flange by a distance slightly greater than the width of the dye ribbon. The end of the cylindrical portion beyond the flange 26 is hollow and has a printer drive receiving cavity

with internal gear teeth 27 for engagement with suitable drive means in the printer. As shown in Figure 3, at the end of the spool carrying the flange 25, an internal recessed web 28 is provided at an appropriate position such that the rod 12 and the recess 28 form a bearing when the spool is positioned in the casing. Such an arrangement has an advantage over the arrangement shown in US 5290114 in which a pip or nipple, which could be broken if the spool is badly handled, for example during transit, protrudes from the end of the spool.

Further details of the construction of the casing and the dye ribbon unit will become apparent from the following description of the operation of placing the dye ribbon unit into the cassette.

The spools are held at a slight inclination to the plane of the cassette and the flanges 25 are slid over the shafts until the rods are received into the recesses provided inside the spools. Axial pressure is then applied to move the rods against the resistance of the springs until the other ends of the spools overlie the arcuate upstands 7,8 which are sufficiently resilient to allow the ends of the spools to pass therebetween upon downward pressure being applied. The flanges 26 are provided with recesses or protuberances 29 which locate with corresponding recesses or protuberances (not shown) in the rib 6 to retain the spools during transit of the cassette. On insertion of the cassette into the printer, the gear teeth 27 engage with the printer drive means and cause axial movement of the spools against the springs 14 until the protuberances are clear of the recesses so as to allow rotation of the spools.

The information mark may be similar to that disclosed in US 5209114, i.e. it may consist of two separate bar codes each covering half the circumference of the cylindrical member, although other configurations are, of course possible. On energisation of the printer, the gear ring 17 is engaged by a drive source in the printer and caused to rotate relative to the feed spool so that at least one of the bar codes is read by a conventional reflection type sensor installed at an appropriate position in the printer.

Claims

1. A dye ribbon cassette for thermal transfer printing comprising a casing containing bearing means having rotatably mounted thereon a cylindrical member having on its periphery a mark carrying information capable of being detected by a sensor on rotation 5 of the member and means operatively engageable with a drive source which is disposed outside of said casing to cause rotation of the member.
2. A cassette according to claim 1 in which a pair of identical, spaced apart, shafts are rigidly mounted at one end of the casing, one of said shafts forming said bearing means for the cylindrical member, the shafts forming respectively mounting points for a feed 10 spool and a take up spool.
3. A cassette according to claim 2, in which each shaft has an axial bore therein through which passes a rod, a spring being positioned between the rod and an endwall of the casing so that the rod is capable of axial movement against the tension of the spring.
4. A cassette for thermal transfer printing comprising a casing comprising two 15 parallel, hemi-cylindrical spool housings having end portions interconnected by bridge members, the housings and bridge members together defining an open access port, a feed spool and a take-up spool located in said housings with a dye ribbon extending therebetween so as to extend across the port, a pair of identical shafts rigidly mounted on one of the bridge members so as to extend along the axes of the spool housings, each shaft having an axial 20 bore therein through which passes a spring-loaded, axially movable rod, the end of which locates in and forms a mounting for a spool, a cylindrical member rotatably mounted on the shaft located in the feed spool and having on its peripheral surface a mark carrying information capable of being detected by a sensor on rotation of the member and means operatively engageable with a drive source which is disposed outside the casing to cause 25 rotation of the member.

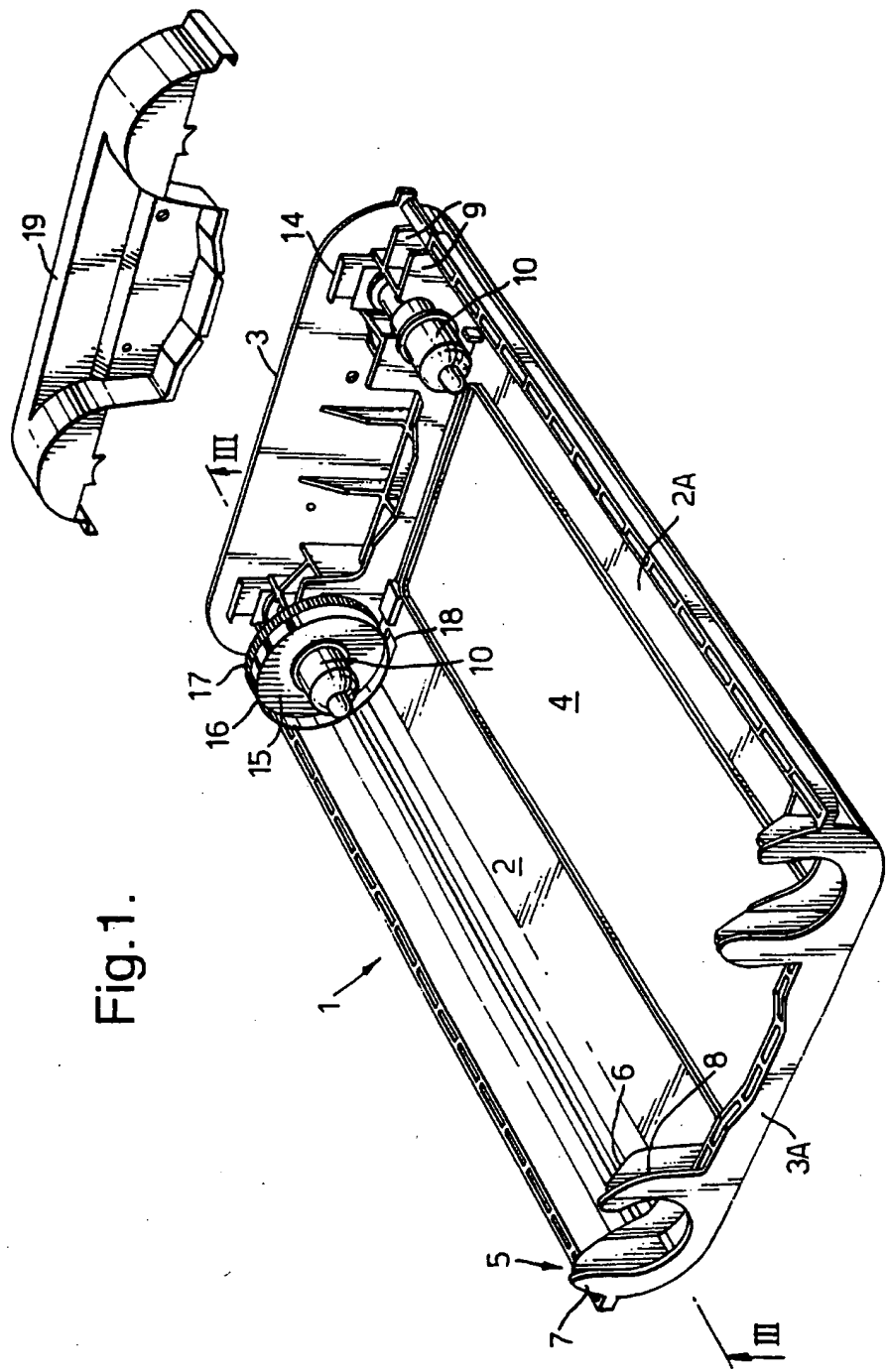
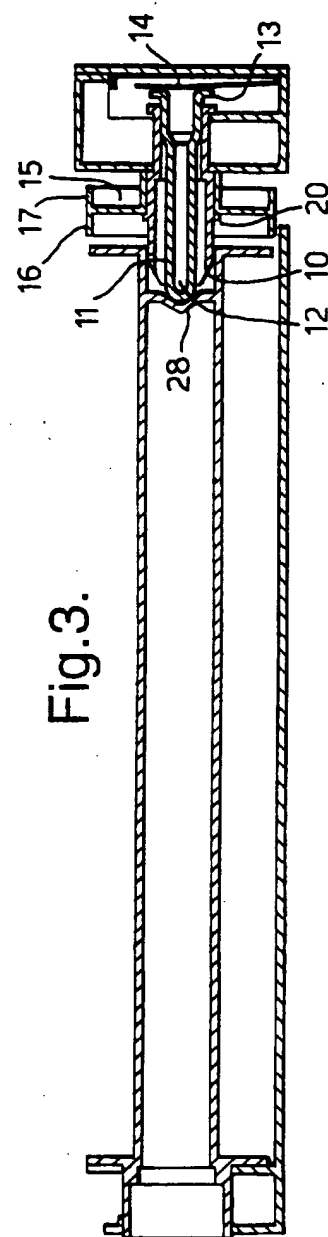
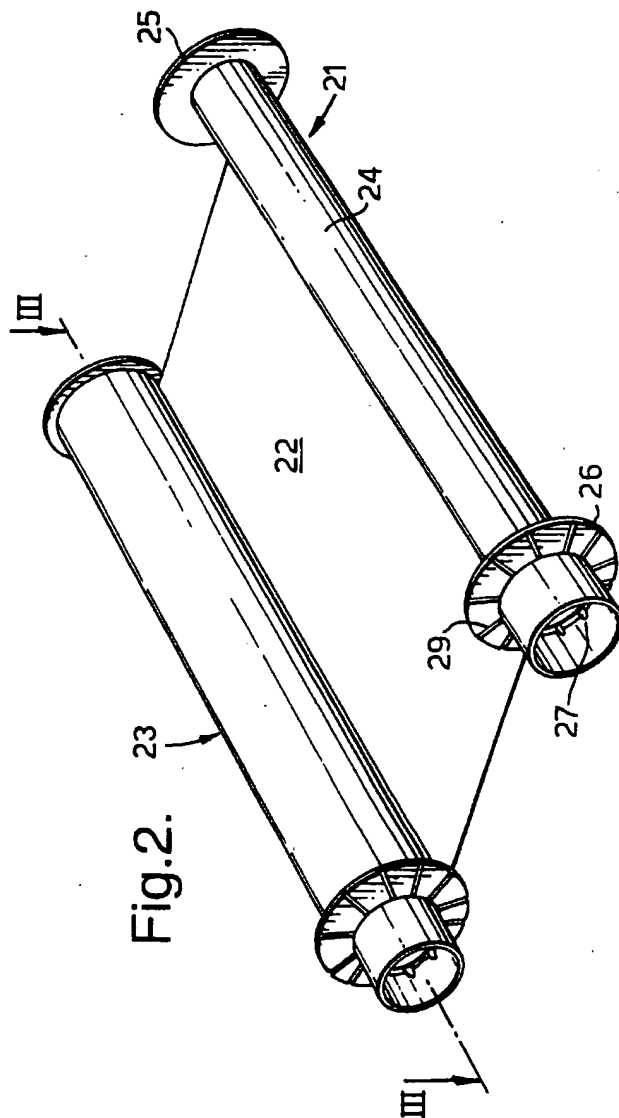


Fig. 1.



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 97/01961

A. CLASSIFICATION OF SUBJECT MATTER IPC 6 B41J17/36 B41J17/32		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 6 B41J		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 096, no. 007, 31 July 1996 & JP 08 058201 A (SONY CORP), 5 March 1996, see abstract ---	1
Y	EP 0 638 434 A (SONY CORP) 15 February 1995 see column 1, line 45 - column 2, line 16; figures 1,37 ---	1-4
Y	DE 40 35 598 A (SIEMENS AG) 7 May 1992 see column 3, line 10 - line 38; figures 2,3 --- ---	1-4
-/--		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents : <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </div> <div style="width: 45%;"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "A" document member of the same patent family </div> </div>		
Date of the actual completion of the international search <div style="text-align: center; font-weight: bold;">26 September 1997</div>	Date of mailing of the international search report <div style="text-align: center; font-weight: bold;">28.10.97</div>	
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3018	Authorized officer <div style="text-align: center; font-weight: bold;">Joosting, T</div>	

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 97/01961

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 515 224 A (MITSUBISHI ELECTRIC CORP) 25 November 1992 see column 28, line 23 - line 54; figures 67,69	2-4
A	EP 0 546 944 A (SONY CORP) 16 June 1993 cited in the application see the whole document	1-4

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/GB 97/01961

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0638434 A	15-02-95	JP 7047733 A CA 2117410 A US 5492422 A	21-02-95 07-02-95 20-02-96
DE 4035598 A	07-05-92	NONE	
EP 0515224 A	25-11-92	JP 5193215 A US 5474394 A EP 0742104 A	03-08-93 12-12-95 13-11-96
EP 0546944 A	16-06-93	JP 5162405 A CA 2085080 A DE 69210189 D DE 69210189 T US 5385416 A	29-06-93 14-06-93 30-05-96 02-10-96 31-01-95

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☒ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.